Digital I/O Board with Opto-Isolation for PCI
PIO-16/16L(PCI)H

Digital Input Board with Opto-Isolation for PCI
PI-32L(PCI)H

Digital Output Board with Opto-Isolation for PCI
PO-32L(PCI)H

User's Guide

CONTEC

Check Your Package

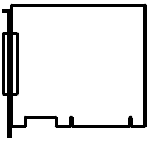
Thank you for purchasing the CONTEC product.

The product consists of the items listed below.

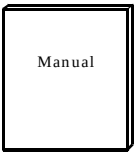
Check, with the following list, that your package is complete. If you discover damaged or missing items, contact your retailer.

Product Configuration List

- Board(One of the following)
  [PIO-16/16L(PCI)H, PI-32L(PCI)H, or PO-32L(PCI)H]
- This User's Manual…1
- CD-ROM [API-PAC(W32)] …1



Board



Manual

CD-ROM
[API-PAC(W32)]

Copyright

Copyright 2003 CONTEC CO., LTD. ALL RIGHTS RESERVED

No part of this document may be copied or reproduced in any form by any means without prior written consent of CONTEC CO., LTD.

CONTEC CO., LTD. makes no commitment to update or keep current the information contained in this document. The information in this document is subject to change without notice.

All relevant issues have been considered in the preparation of this document. Should you notice an omission or any questionable item in this document, please feel free to notify CONTEC CO., LTD.

Regardless of the foregoing statement, CONTEC assumes no responsibility for any errors that may appear in this document nor for results obtained by the user as a result of using this product.

Trademarks

MS, Microsoft, Windows, Windows NT and MS-DOS are trademarks of Microsoft Corporation. Other brand and product names are trademarks of their respective holder.

Table of Contents

Check Your Package i

Copyright ii

Trademarks ii

Table of Contents iii

1. BEFORE USING THE PRODUCT 1

About the Board 1
- Features 1
- Support Software 2
- Cable & Connector (Option) 3
- Accessories (Option) 3

Customer Support 4
- Web Site http://www.contec.co.jp/en/ 4

Limited Three-Year Warranty 4

How to Obtain Service 4

Liability 4

Safety Precautions 5
- Safety Information 5
- Handling Precautions 5
- Environment 6
- Inspection 6
- Storage 6

2. SETUP 7

What is Setup? 7
- Using the Board under Windows Using the Driver Library Package API-PAC(W32) 7
- Using the Board under Windows Using Software Other than the Driver Library Package API-PAC(W32) 7
- Using the Board under an OS Other than Windows 8

Step 1 Installing the Software 9
- Starting the Install Program 9
- Selecting the Digital I/O Driver 10
- Executing the Installation 11

Step 2 Setting the Hardware 12
- Parts of the Board and Factory Defaults 12
- Setting the Board ID 13
- Plugging the Board 14

Step 3 Installing the Hardware 15
- Turning on the PC 15
- Setting with the Add New Hardware Wizard 15

Step4 Initializing the Software 18
Invoking API-TOOL Configuration 18
Updating the Settings 18
Step 5 Checking Operations with the Diagnosis Program 19
What is the Diagnosis Program? 19
Check Method 19
Using the Diagnosis Program 20
Setup Troubleshooting 23
Symptoms and Actions 23
If your problem cannot be resolved 23

3. EXTERNAL CONNECTION 25

Using the On-board Connectors 25
Connecting a Device to a Connector 25
Connector Pin Assignment 26
Relationships between API-PAC(W32) Logical Ports/Bits and Connector Signal Pins 28
Connecting Input Signals 30
Input Circuit 30
Connecting a Switch 30
Output Circuit 31
Output Circuit 31
Connection to the LED 32
Example of Connection to TTL Level Input 32
Connecting the Sink Type Output and Sink Output Support Input 33

4. FUNCTION 35

Data I/O Function 35
Data Input 35
Data Output 35
Monitoring Output Data 35
Digital Filter 36
Digital Filter Function Principle 36
Set Digital Filter Time 36
Interrupt Control Function 38
Disabling/enabling Interrupts 38
Selecting the Interrupt Edge 38
Clearing the Interrupt Status and Interrupt Signal 38

5. ABOUT SOFTWARE 39

Accessing the Help File 39
Using Sample Programs 40
Uninstalling the Driver Libraries 42

CD-ROM Directory Structure 43

6. ABOUT HARDWARE 45

Hardware specification 45
Block Diagram 49
Differences between the PIO-16/16L(PCI)H and PIO-16/16L(PCI) 52
Differences between the PI-32L(PCI)H and PI-32L(PCI) 53
Differences between the PO-32L(PCI)H and PO-32L(PCI) 54

1. Before Using the Product

This chapter provides information you should know before using the product.

About the Board

This board is a PCI-compliant interface board for input/output of digital signals.
The board can input and output digital signals at 12 to 24 VDC.

<PIO-16/16L(PCI)H> can input and output up to 16 channels.
<PI-32L(PCI)H> can input up to 32 channels.
<PO-32L(PCI)H> can output up to 32 channels.

Using the bundled API function library package [API-PAC(W32)], you can create Windows application software for this board in your favorite programming language supporting Win32 API functions, such as Visual Basic or Visual C/C++.

Features

- A different external power supply can be used for each common pin as it is shared by 16 channels.
- The PCI bus (personal computer) and the I/O interface are isolated from each other by an opto-coupler, offering good noise immunity.
- You can use all of the input signals as interrupt inputs.
  You can also select the interrupt trigger edge of the input signal.
  <PIO-16/16L(PCI)H>, <PI-32L(PCI)H>
- The board has a digital filter feature to prevent noise or chatter from causing erroneous inputs.
  <PIO-16/16L(PCI)H>, <PI-32L(PCI)H>
- Up to 35VDC, 100mA per signal, max. output.
  <PIO-16/16L(PCI)H>, <PO-32L(PCI)H>
- Zener diode connected to output transistors for protection from surge voltage. Overcurrent protective device provided for every eight channels of output transistors.
  <PIO-16/16L(PCI)H>, <PO-32L(PCI)H>

Support Software

You should use CONTEC support software according to your purpose and development environment.

Driver Software Package **API-PAC(W32)** (Available for downloading (free of charge) from the CONTEC web site.)

API-PAC(W32) is the library software that provides the commands for CONTEC hardware products in the form of Windows standard Win32 API functions (DLL). It makes it easy to create high-speed application software taking advantage of the CONTEC hardware using various programming languages that support Win32 API functions, such as Visual Basic and Visual C/C++.

It can also be used by the installed diagnosis program to check hardware operations.

CONTEC provides download services (at http://www.contec.co.jp/en/) to supply the updated drivers and differential files.

For details, read Help on the bundled CD-ROM or visit the CONTEC's Web site.

< Operating environment >

OS	Windows XP, 2000, NT, Me, 98, etc..
Adaptation language	Visual C/C++, Visual Basic, Delphi, Builder, etc..
Others	Each piece of library software requires 50 megabytes of free hard disk space.

Base package of ActiveX components for measurement system development
ACX-PAC(W32)BP (Option)

This is a set of useful Windows development tools for measurement systems and consists of a software component library with ready-to-use samples which you can combine for easy programming.
The package contains components for controlling CONTEC I/O boards (PC cards). Features include interface control for analog I/O, digital I/O, GPIB communications, and counter inputs, as well as X-Y plotting and file storage support.
Check the CONTEC's Web site for more information on this soft.

Advanced package of ActiveX components for measurement system development
ACX-PAC(W32)AP (Option)

Complements the ACX-PAC(W32)BP functions with additional components including graphics (plotting, switches, and lamps, etc.) and mathematical and analysis tools.
Check the CONTEC's Web site for more information on this soft.

Linux version of general-purpose I/O driver: **IO-LIB(LNX)** (Available for free download)

This driver software is used to control (the I/O access of) CONTEC I/O boards (cards) from within Linux.

You can download it from the CONTEC's web site.

You can also download the I/O port map and configuration register information required for board control (I/O access) from the CONTEC's web site.
Check the CONTEC's Web site for more information on this soft.

Cable & Connector (Option)

Flat Cable with a 37-Pin D-type Connectors on 2Ends	: PCB37P-* (1.5m, 3m, 5m)
Shielded cable with two 37-pin D--Type connectors	: PCB37PS-*P (0.5m, 1.5m, 3m, 5m)
Flat Cable with a 37-pin D-type Connector	: PCA37P-* (1.5m, 3m, 5m)
Shielded Cable with Two 37-pin D-Type Connectors	: PCA37PS-*P (0.5m, 1.5m, 3m, 5m)
D-SUB37P Male Connector Set (5 Pieces)	: CN5-D37M

Accessories (Option)

Screw Terminal	: EPD-37 *1
Termination Panel (M3)	: DTP-3(PC)
Termination Panel	: DTP-4(PC)
Signal Monitor for Digital I/O	: CM-32(PC)E *1

*1 A PCB37PS or PCB37PS optional cable is required separately.

* Check the CONTEC's Web site for more information on these options.

Customer Support

CONTEC provides the following support services for you to use CONTEC products more efficiently and comfortably.

Web Site http://www.contec.co.jp/en/

Latest product information

CONTEC provides up-to-date information on products.

CONTEC also provides product manuals and various technical documents in the PDF.

Free download

You can download updated driver software and differential files as well as sample programs available in several languages.

Note! For product information
Contact your retailer if you have any technical question about a CONTEC product or need its price, delivery time, or estimate information.

Limited Three-Year Warranty

CONTEC Interface boards are warranted by CONTEC CO., LTD. to be free from defects in material and workmanship for up to three years from the date of purchase by the original purchaser.

Repair will be free of charge only when this device is returned freight prepaid with a copy of the original invoice and a Return Merchandise Authorization to the distributor or the CONTEC group office, from which it was purchased.

This warranty is not applicable for scratches or normal wear, but only for the electronic circuitry and original boards. The warranty is not applicable if the device has been tampered with or damaged through abuse, mistreatment, neglect, or unreasonable use, or if the original invoice is not included, in which case repairs will be considered beyond the warranty policy.

How to Obtain Service

For replacement or repair, return the device freight prepaid, with a copy of the original invoice. Please obtain a Return Merchandise Authorization Number (RMA) from the CONTEC group office where you purchased before returning any product.

* No product will be accepted by CONTEC group without the RMA number.

Liability

The obligation of the warrantor is solely to repair or replace the product. In no event will the warrantor be liable for any incidental or consequential damages due to such defect or consequences that arise from Safety Precautions

Understand the following definitions and precautions to use the product safely.

Safety Precautions

Understand the following definitions and precautions to use the product safely.

Safety Information

This document provides safety information using the following symbols to prevent accidents resulting in injury or death and the destruction of equipment and resources. Understand the meanings of these labels to operate the equipment safely.

⚠ DANGER	DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.
⚠ WARNING	WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠ CAUTION	CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or in property damage.

Handling Precautions

⚠ DANGER

Do not use the product where it is exposed to flammable or corrosive gas. Doing so may result in an explosion, fire, electric shock, or failure.

⚠ CAUTION

- There are switches on the board that need to be set in advance. Be sure to check these before installing the board.
- Only set the switches and jumpers on the board to the specified settings.
  Otherwise, the board may malfunction, overheat, or cause a failure.
- Do not strike or bend the board. Doing so could damage the board.
  Otherwise, the board may malfunction, overheat, cause a failure or breakage.
- Do not touch the board's metal plated terminals (edge connector) with your hands.
  Otherwise, the board may malfunction, overheat, or cause a failure.
  If the terminals are touched by someone's hands, clean the terminals with industrial alcohol.
- Do not install or remove the board to or from the slot while the computer's power is turned on.
  Otherwise, the board may malfunction, overheat, or cause a failure.
  Doing so could cause trouble. Be sure that the personal computer or the I/O expansion unit power is turned off.
- Make sure that your PC or expansion unit can supply ample power to all the boards installed.
  Insufficiently energized boards could malfunction, overheat, or cause a failure.
- The specifications of this product are subject to change without notice for enhancement and quality improvement.
  Even when using the product continuously, be sure to read the manual and understand the contents.

- Do not modify the product. CONTEC will bear no responsibility for any problems, etc., resulting from modifying this product.
- Regardless of the foregoing statements, CONTEC is not liable for any damages whatsoever (including damages for loss of business profits) arising out of the use or inability to use this CONTEC product or the information contained herein.

Environment

Use this product in the following environment. If used in an unauthorized environment, the board may overheat, malfunction, or cause a failure.

Operating temperature

0 to 50°C

Humidity

10 to 90%RH (No condensation)

Corrosive gases

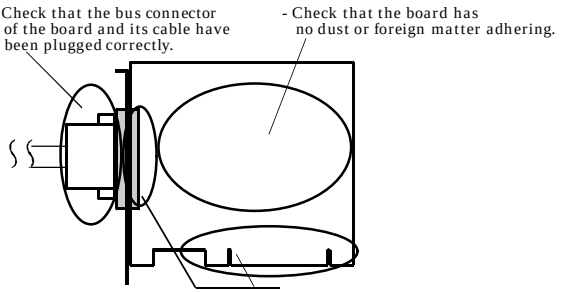
None

Floating dust particles

Not to be excessive

Inspection

Inspect the product periodically as follows to use it safely.


- Check that the bus connector of the board and its cable have been plugged correctly.
- Check that the board has no dust or foreign matter adhering.

Storage

When storing this product, keep it in its original packing form.

(1) Put the board in the storage bag.

(2) Wrap it in the packing material, then put it in the box.

(3) Store the package at room temperature at a place free from direct sunlight, moisture, shock, vibration, magnetism, and static electricity.

2. Setup

This chapter explains how to set up the board.

What is Setup?

Setup means a series of steps to take before the product can be used.

Different steps are required for software and hardware

The setup procedure varies with the OS and applications used.

Using the Board under Windows

Using the Driver Library Package API-PAC(W32)

This section describes the setup procedure to be performed before you can start developing application programs for the board using the bundled CD-ROM “Driver Library API-PAC(W32)”.

Taking the following steps sets up the software and hardware. You can use the diagnosis program later to check whether the software and hardware function normally.

Step 1 Installing the Software

Step 2 Setting the Hardware

Step 3 Installing the Hardware

Step 4 Initializing the Software

Step 5 Checking Operations with the Diagnosis Program

If Setup fails to be performed normally, see the “Setup Troubleshooting” section at the end of this chapter.

Using the Board under Windows

Using Software Other than the Driver Library Package API-PAC(W32)

For setting up software other than API-PAC(W32), refer to the manual for that software. See also the following parts of this manual as required.

This chapter Step 2 Setting the Hardware

This chapter Step 3 Installing the Hardware

Chapter 3 External Connection

Chapter 6 About Hardware

Using the Board under an OS Other than Windows

For using the board under an OS other than Windows, see the following parts of this manual.

This chapter Step 2 Setting the Hardware

Chapter 3 External Connection

Chapter 6 About Hardware

Step 1 Installing the Software

This section describes how to install the Driver libraries.

Before installing the hardware on your PC, install the Driver libraries from the bundled API-PAC(W32) CD-ROM.

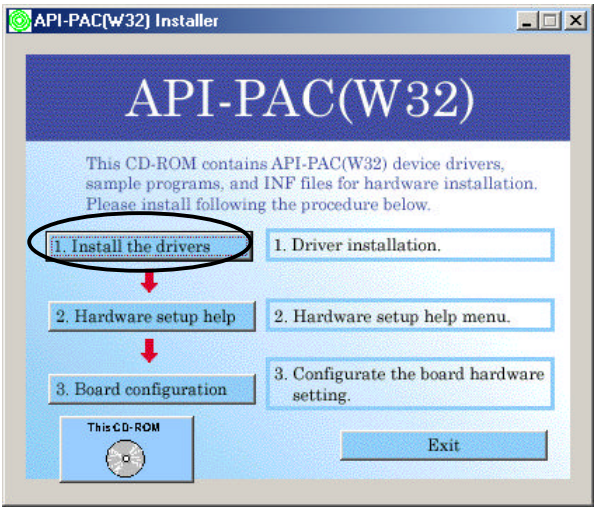
The following description assumes the operating system as Windows Me. Although some user interfaces are different depending on the OS used, the basic procedure is the same.

Starting the Install Program

(1) Load the CD-ROM [API-PAC(W32)] on your PC.

(2) The API-PAC(W32) Installer window appears automatically. If the panel does not appear, run (CD-ROM drive letter):\AUTORUN.exe.

(3) Click on the [Install the drivers] button.


API-PAC(W32) Installer
API-PAC(W32)
This CD-ROM contains API-PAC(W32) device drivers, sample programs, and INF files for hardware installation. Please install following the procedure below.
1. Install the drivers
1. Driver installation.
2. Hardware setup help
2. Hardware setup help menu.
3. Board configuration
3. Configurate the board hardware setting.
This CD-ROM
Exit

⚠ CAUTION

Before installing the software in Windows XP, 2000, or NT, log in as a user with administrator privileges.

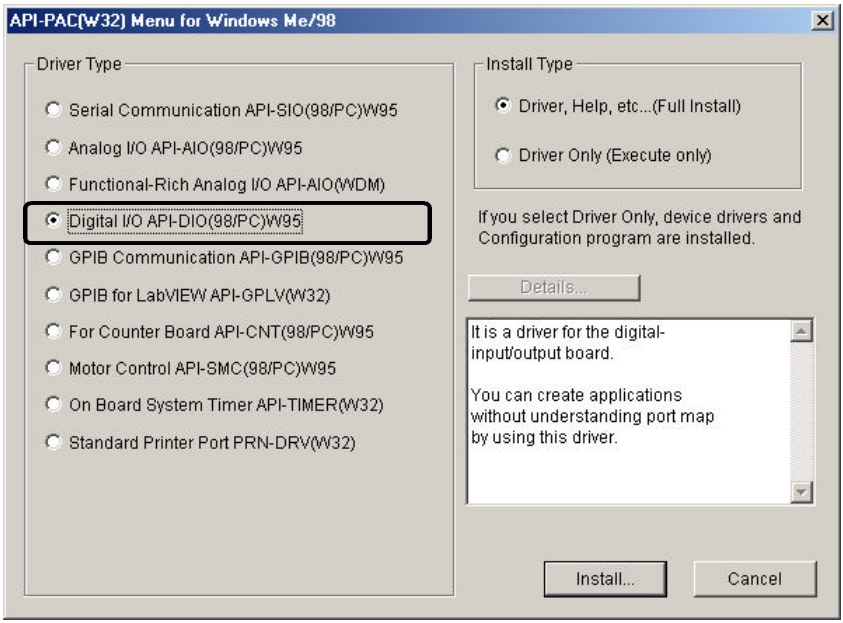
Selecting the Digital I/O Driver

(1) The following dialog box appears to select “Driver Type” and “Install Type”.

(2) Select “Digital I/O API-DIO(98/PC)W95”.

(3) **Select “Driver, Help, etc… (Full install)”.**

(4) **Click on the [Install] button.**


API-PAC(W32) Menu for Windows Me/98
Driver Type
Serial Communication API-SIO(98/PC)W95
Analog I/O API-AIO(98/PC)W95
Functional-Rich Analog I/O API-AIO(WDM)
Digital I/O API-DIO(98/PC)W95
GPIB Communication API-GPIB(98/PC)W95
GPIB for LabVIEW API-GPLV(W32)
For Counter Board API-CNT(98/PC)W95
Motor Control API-SMC(98/PC)W95
On Board System Timer API-TIMER(W32)
Standard Printer Port PRN-DRV(W32)
Install Type
Driver, Help, etc...(Full Install)
Driver Only (Execute only)
If you select Driver Only, device drivers and Configuration program are installed.
Details...
It is a driver for the digital-input/output board.
You can create applications without understanding port map by using this driver.
Install...
Cancel

Executing the Installation

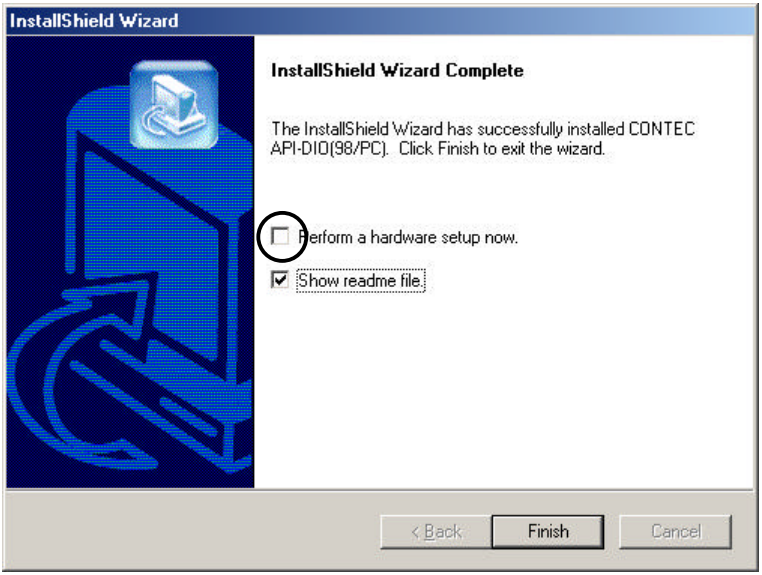
(1) **Follow the on-screen instructions to proceed to install.**

(2) When the required files have been copied, the “Perform a hardware setup now” and “Show readme file” check boxes are displayed.

When you are installing the software or hardware for the first time:
1) Uncheck “Perform a hardware setup now”.
2) Click on the [Finish] button. Go to Step 2 to set and plug the hardware.

*When the hardware has already been installed:

Check “Perform a hardware setup now”, then go to Step 4 “Initializing the Software”.



You have now finished installing the software.

Step 2 Setting the Hardware

This section describes how to set the board and plug it on your PC.

The board has some switches and jumper to be preset.

Check the on-board switches and jumpers before plugging the board into an expansion slot.

The board can be set up even with the factory defaults untouched. You can change board settings later.

Parts of the Board and Factory Defaults

Figure 2.1. shows the names of major parts on the board.

Note that the switch setting shown below is the factory default.

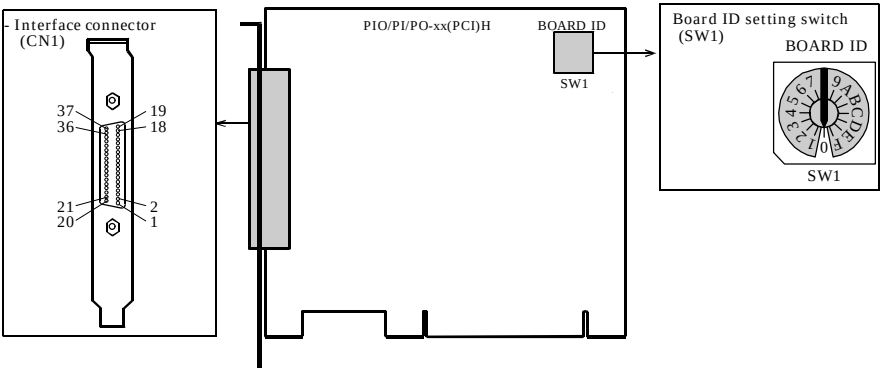


Figure 2.1. Component Locations

Setting the Board ID

If you install two or more boards on one personal computer, assign a different ID value to each of the boards to distinguish them.

The board IDs can be set from 0 to Fh to identify up to sixteen boards.

If only one board is used, the original factory setting (Board ID = 0) should be used.

Setting Procedure

To set the board ID, use the rotary switch on the board. Turn the SW1 knob to set the board ID as shown below.

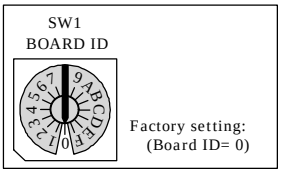


Figure 2.2. Board ID Settings (SW1)

Plugging the Board

(1) Before plugging the board, shut down the system, unplug the power code of your PC.

(2) Remove the cover from the PC so that the board can be mounted.

(3) Plug the board into an expansion slot.

(4) Attach the board bracket to the PC with a screw.

(5) Put the cover back into place.

⚠ CAUTION

- Do not touch the board's metal plated terminals (edge connector) with your hands.
  Otherwise, the board may malfunction, overheat, or cause a failure.
  If the terminals are touched by someone's hands, clean the terminals with industrial alcohol.
- Do not install or remove the board to or from the slot while the computer's power is turned on.
  Otherwise, the board may malfunction, overheat, or cause a failure.
  Doing so could cause trouble. Be sure that the personal computer or the I/O expansion unit power is turned off.
- Make sure that your PC or expansion unit can supply ample power to all the boards installed.
  Insufficiently energized boards could malfunction, overheat, or cause a failure.

Step 3 Installing the Hardware

For using an expansion board under Windows, you have to let the OS detect the I/O addresses and IRQ to be used by the board. The process is referred to as installing the hardware.

In the case of using two or more boards, make sure you install one by one with the Add New Hardware Wizard.

Turning on the PC

Turn on the power to your PC.

⚠ CAUTION

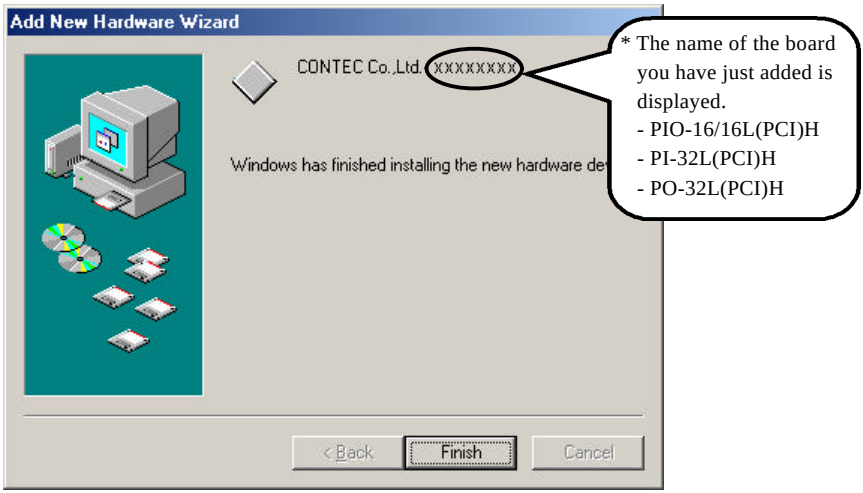
- The board cannot be properly installed unless the resources (I/O addresses and interrupt level) for the board can be allocated. Before attempting to install the board, first determine what PC resources are free to use.
- The resources used by each board do not depend on the location of the PCI bus slot or the board itself. If you remove two or more boards that have already been installed and then remount one of them on the computer, it is unknown that which one of the sets of resources previously assigned to the two boards is assigned to the remounted board. In this case, you must check the resource settings.

Setting with the Add New Hardware Wizard

(1) The "Add New Hardware Wizard" will be started.
Select "Specify the location of the driver", then click on the [Next] button.
If you are using Windows NT 4.0, the "Add New Hardware Wizard" is not started. Go to Step 4 "Initializing the Software".

Add New Hardware Wizard
Windows has found the following new hardware:
PCI Multimedia Device
Windows can automatically search for and install software that supports your hardware. If your hardware came with installation media, insert it now and click Next.
What would you like to do?
Automatic search for a better driver (Recommended)
Specify the location of the driver (Advanced)
< Back
Next >
Cancel

(2) Specify that folder on the CD-ROM which contains the setup information (INF) file to register the board.

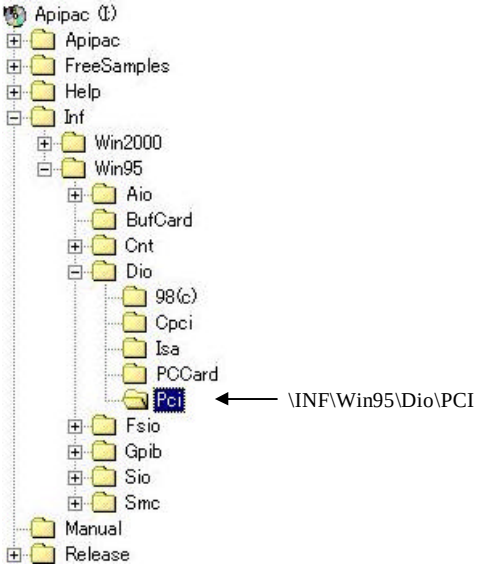


Source folder

The setup information (INF) file is contained in the following folder on the bundled CD-ROM.

Windows XP, 2000	\INF\Win2000\Dio\PCI
Windows Me, 98, 95	\INF\Win95\Dio\PCI

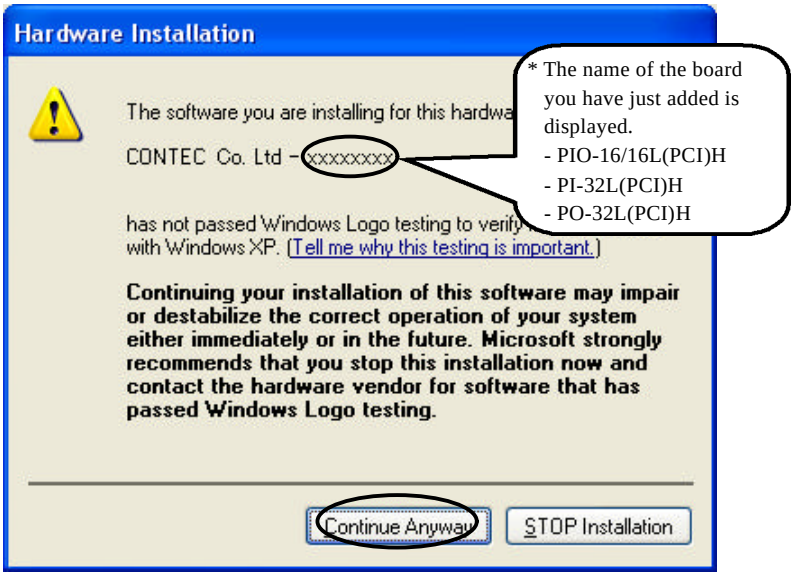
Example of specifying the folder for use under Windows Me



⚠ CAUTION

In Windows XP, the Hardware Wizard displays the following alert dialog box when you have located the INF file. This dialog box appears, only indicating that the relevant driver has not passed Windows Logo testing, and it can be ignored without developing any problem with the operation of the board.

In this case, click on the [Continue Anyway] button.


Hardware Installation
The software you are installing for this hardwa
CONTEC Co. Ltd - xxxxxxxx
has not passed Windows Logo testing to verify
with Windows XP. (Tell me why this testing is important.)
Continuing your installation of this software may impair or destabilize the correct operation of your system either immediately or in the future. Microsoft strongly recommends that you stop this installation now and contact the hardware vendor for software that has passed Windows Logo testing.
Continue Anyway
STOP Installation
* The name of the board you have just added is displayed.
- PIO-16/16L(PCI)H
- PI-32L(PCI)H
- PO-32L(PCI)H

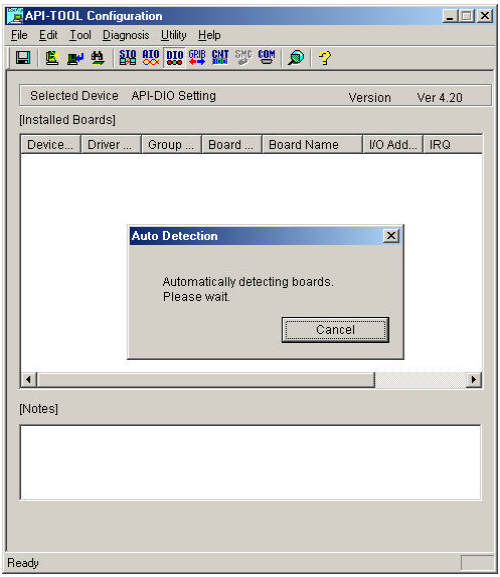
You have now finished installing the software.

Step4 Initializing the Software

The API function library requires the initial setting to recognize the execution environment. It is called the initialization of the Driver library.

Invoking API-TOOL Configuration

(1) Open the Start Menu, then select “Programs” – “CONTEC API-PAC(W32)” – “API-TOOL Configuration”.



(2) API-TOOL Configuration detects boards automatically.

The detected boards are listed.

Updating the Settings

(1) Select “Save settings to registry…” from the “File” menu.

You have now finished installing the initial setting of Software.

Step 5 Checking Operations with the Diagnosis Program

Use the diagnosis program to check that the board and driver software work normally, thereby you can confirm that they have been set up correctly.

What is the Diagnosis Program?

The diagnosis program diagnoses the states of the board and driver software.

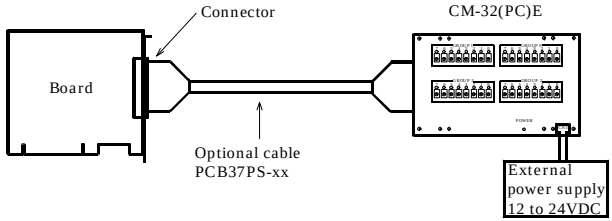
It can also be used as a simple checker when an external device is actually connected.

Using the “Diagnosis Report” feature reports the driver settings, the presence or absence of the board, I/O status, and interrupt status.

Check Method

Connect the board to a remote device to text the input/output and check the execution environment.
For this board, prepare an external power supply (12 to 24 V).
The Check Mate (CM-32(PC)E) comes in handy when you check digital I/O boards.
Check the board with the factor defaults untouched.

Connection diagram



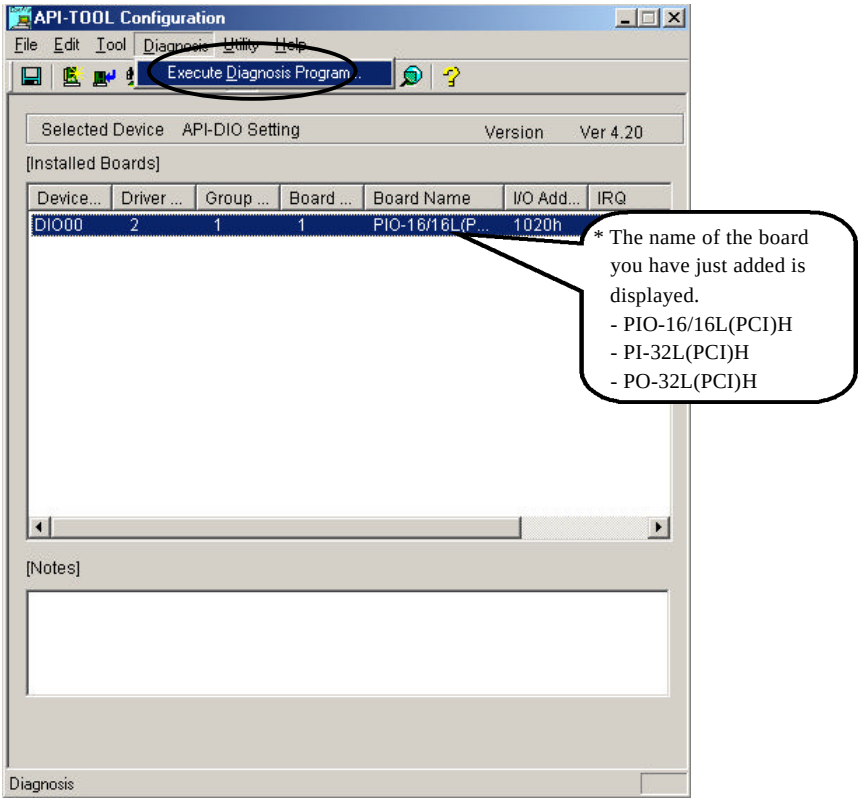
To connect a device other than the Check Mate, see Chapter 3 “External Connection”.

Using the Diagnosis Program

Starting the Diagnosis Program

Select the board in the API-TOOL Configuration windows, then run the Diagnosis Program.

* The name of the board you have just added is displayed.

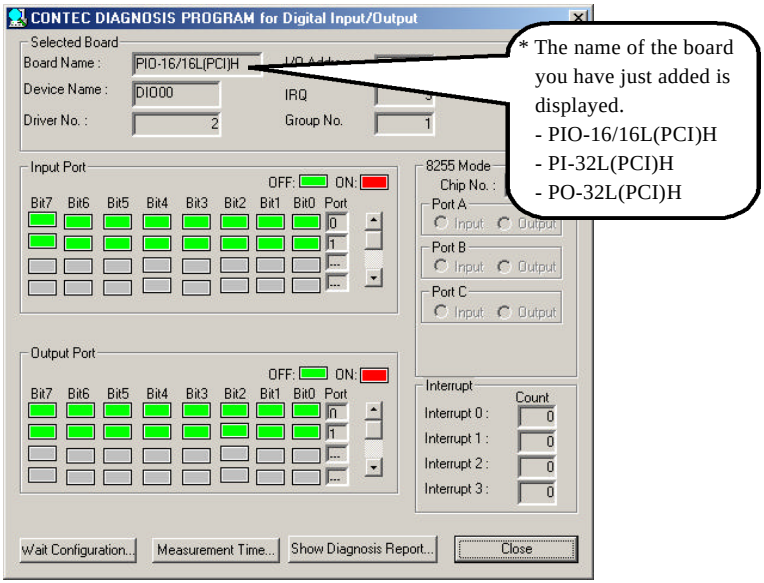

API-TOOL Configuration
File Edit Tool Diagnosis Utility Help
Execute Diagnosis Program...
Selected Device API-DIO Setting
Version Ver 4.20
[Installed Boards]
Device... Driver ... Group ... Board ... Board Name I/O Add... IRQ
DIO00 2 1 1 PIO-16/16L(P... 1020h
[Notes]
Diagnosis
* The name of the board you have just added is displayed.
- PIO-16/16L(PCI)H
- PI-32L(PCI)H
- PO-32L(PCI)H

Checking Digital Inputs and Outputs

The main panel of the Diagnosis Program appears.

You can check the current operation states of the board in the following boxes:

"Input Port" : Displays input values bit by bit at fixed time intervals.
"Output Port" : Mouse operation allows the data to output or display.
"Interrupt" : Displays the number of interrupts detected bit by bit.



To use the wait time control feature, click on the [Wait Configuration] button. Use the feature when the wait time based on the DioWait or DioWaitEx function is not normal.

To use the function execution time measurement feature, click on the [Measurement Time] button. Enter the I/O start port and the number of ports, then press the measurement button. The time for each execution of a function will be measured.

Diagnosis Report

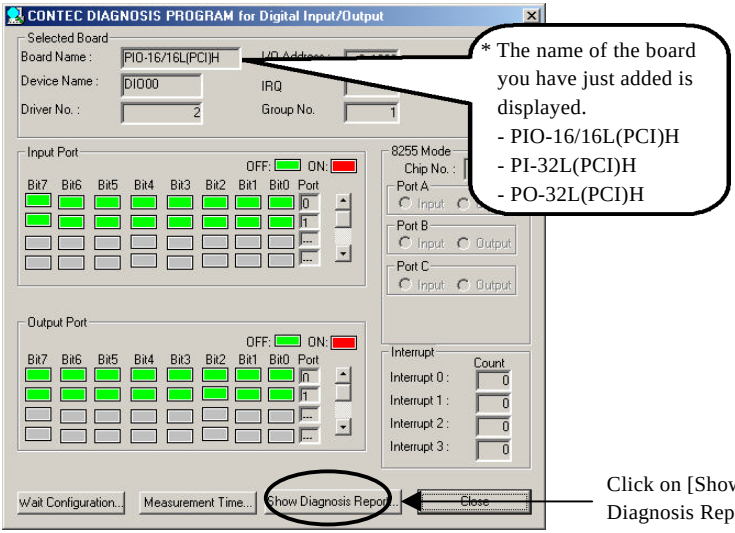
(1) Clicking on the [Show Diagnosis Report] button displays detailed data such as board settings and the diagnosis results while saving them in text format.

The results are saved and displayed as a text file (DioRep.txt) in the install folder (Program Files\CONTEC\API-PAC(W32)).

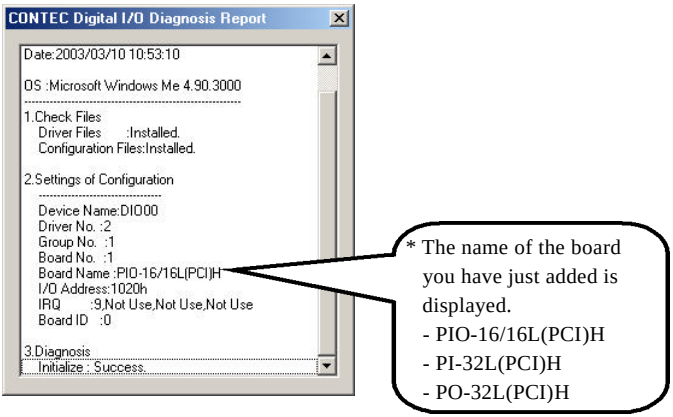
The Diagnosis Program performs “board presence/absence check”, “driver file test”, “board setting test”, and so on.

⚠ CAUTION

Before executing diagnosis report output, unplug the cable from the board.



(2) A diagnosis report is displayed as shown below.



Setup Troubleshooting

Symptoms and Actions

The board cannot be initialized [Windows NT 4.0**]**

The driver may not yet be activated.

When using the board under an OS not compliant with Plug and Play, such as Windows NT 4.0, make sure that the [PnP OS] BIOS option has been set to [NO], [disable], or [Do not use]. If the option has been set to [Windows 95], for example, the board may not be detected normally. For details on BIOS settings, refer to the user's guide for your PC.

No output can be obtained.

Use API-TOOL Configuration to check whether the board name setting is wrong.

The board works with the Diagnosis Program but not with an application.

The Diagnosis Program is coded with API-TOOL functions. As long as the board operates with the Diagnosis Program, it is to operate with other applications as well. In such cases, review your program while paying attention to the following points:

- Check the arguments to functions and their return values.
- When the board is an isolated type, it has a time lag for its response between the output by a function and the actual output. Consider the execution intervals between functions.

The OS won't normally get started or detect the board. [Windows XP, 2000**]**

Turn off the power to your PC, then unplug the board. Restart the OS and delete the board settings of API-TOOL Configuration. Turn off the PC again, plug the board, and restart the OS. Let the OS detect the board and use API-TOOL Configuration to register board settings.

If your problem cannot be resolved

Contact your retailer.

3. External Connection

This chapter describes the interface connectors on the board and the external I/O circuits.

Check the information available here when connecting an external device.

Using the On-board Connectors

Connecting a Device to a Connector

To connect an external device to this board, plug the cable from the device into the interface connector shown below.

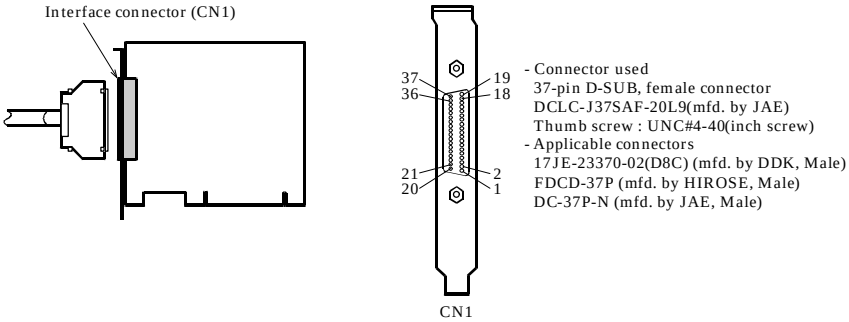
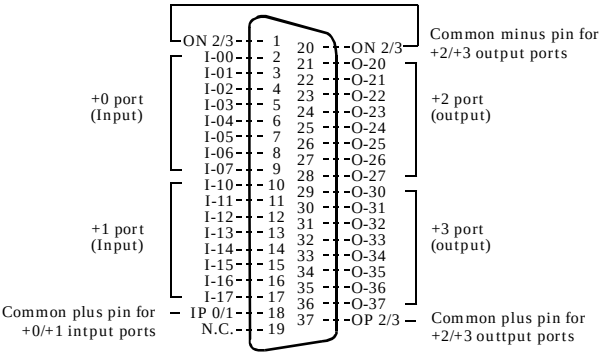


Figure 3.1. Interface Connector and Applicable Cable Connector

Connector Pin Assignment

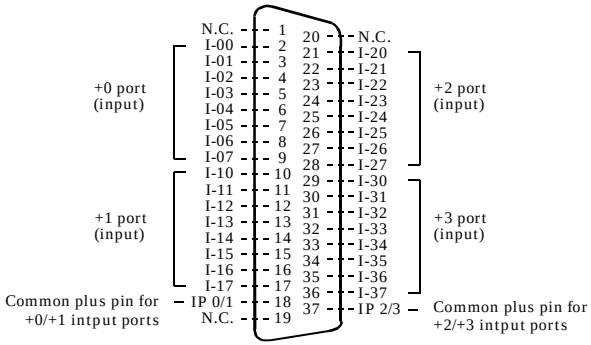
Pin Assignments of Interface Connector<PIO-16/16L(PCI)H>



I-00 to I-17	16 input signal pins. Connect output signals from the external device to these pins.
O20 to O37	16 output signal pins. Connect these pins to the input signal pins of the external device.
IP 0/1	Connect the positive side of the external power supply. These pins are common to 16 input signal pins.
OP 2/3	Connect the positive side of the external power supply. These pins are common to 16 output signal pins.
ON 2/3	Connect the negative side of the external power supply. These pins are common to 16 output signal pins.
N.C.	This pin is left unconnected.

Figure 3.2. Pin Assignments of Interface Connector <PIO-16/16L(PCI)H>

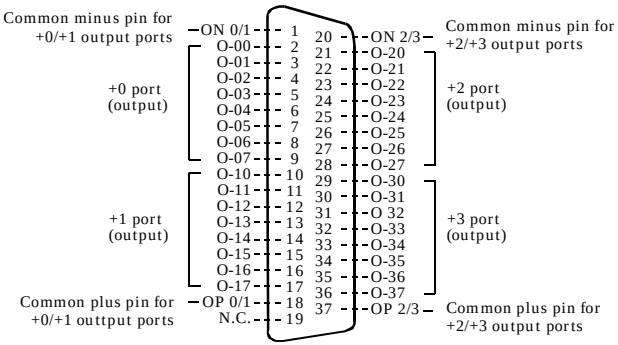
Pin Assignments of Interface Connector <PI-32L(PCI)H>



I-00 to I-37	32 input signal pins. Connect output signals from the external device to these pins.
IP 0/1 to IP 2/3	Connect the positive side of the external power supply. These pins are common to 16 input signal pins.
N.C.	This pin is left unconnected.

Figure 3.3. Pin Assignments of Interface Connector <PI-32L(PCI)H>

Pin Assignments of Interface Connector <PO-32L(PCI)H>



O-00 to O-37	32 input signal pins. Connect input signals from the external device to these pins.
OP 0/1 to OP 2/3	Connect the positive side of the external power supply. These pins are common to 16 input signal pins.
ON 0/1 to ON 2/3	Connect the negative side of the external power supply. These pins are common to 16 output signal pins.
N.C.	This pin is left unconnected.

Figure 3.4. Pin Assignments of Interface Connector <PO-32L(PCI)H>

Relationships between API-PAC(W32) Logical Ports/Bits and Connector Signal Pins

The following table lists the relationships between the connector signal pins and the logical port/bit numbers used for I/O functions when applications are written with API-PAC(W32).

PIO-16/16L(PCI)H

Table 3.1. Logical Ports, Logical Bits, and Connector Signal Pins <PIO-16/16L(PCI)H>

	D7	D6	D5	D4	D3	D2	D1	D0
Input logical port 0	I-07 [7]	I-06 [6]	I-05 [5]	I-04 [4]	I-03 [3]	I-02 [2]	I-01 [1]	I-00 [0]
Input logical port 1	I-17 [15]	I-16 [14]	I-15 [13]	I-14 [12]	I-13 [11]	I-12 [10]	I-11 [9]	I-10 [8]

	D7	D6	D5	D4	D3	D2	D1	D0
Output logical port 0	O-27 [7]	O-26 [6]	O-25 [5]	O-24 [4]	O-23 [3]	O-22 [2]	O-21 [1]	O-20 [0]
Output logical port 1	O-37 [15]	O-36 [14]	O-35 [13]	O-34 [12]	O-33 [11]	O-32 [10]	O-31 [9]	O-30 [8]

Note: I-xx and O-xx represent input and output signals, respectively, where [xx] indicates a logical bit.

PI-32L(PCI)H

Table 3.2. Relationships between Logical Ports/Bits and Connector Signal Pins <PI-32L(PCI)H>

	D7	D6	D5	D4	D3	D2	D1	D0
Input logical port 0	I-07 [7]	I-06 [6]	I-05 [5]	I-04 [4]	I-03 [3]	I-02 [2]	I-01 [1]	I-00 [0]
Input logical port 1	I-17 [15]	I-16 [14]	I-15 [13]	I-14 [12]	I-13 [11]	I-12 [10]	I-11 [9]	I-10 [8]
Input logical port 2	I-27 [23]	I-26 [22]	I-25 [21]	I-24 [20]	I-23 [19]	I-22 [18]	I-21 [17]	I-20 [16]
Input logical port 3	I-37 [31]	I-36 [30]	I-35 [29]	I-34 [28]	I-33 [27]	I-32 [26]	I-31 [25]	I-30 [24]

Note: I-xx represent input signals, respectively, where [xx] indicates a logical bit.

PO-32L(PCI)H

Table 3.3. Relationships between Logical Ports/Bits and Connector Signal Pins <PO-32L(PCI)H>

	D7	D6	D5	D4	D3	D2	D1	D0
Output logical port 0	O-07 [7]	O-06 [6]	O-05 [5]	O-04 [4]	O-03 [3]	O-02 [2]	O-01 [1]	O-00 [0]
Output logical port 1	O-17 [15]	O-16 [14]	O-15 [13]	O-14 [12]	O-13 [11]	O-12 [10]	O-11 [9]	O-10 [8]
Output logical port 2	O-27 [23]	O-26 [22]	O-25 [21]	O-24 [20]	O-23 [19]	O-22 [18]	O-21 [17]	O-20 [16]
Output logical port 3	O-37 [31]	O-36 [30]	O-35 [29]	O-34 [28]	O-33 [27]	O-32 [26]	O-31 [25]	O-30 [24]

Note: O-xx represent output signals, respectively, where [xx] indicates a logical bit.

⚠ CAUTION

The logical port and logical bit numbers are virtual port and bit numbers that enable programming independent of board I/O addresses or board types.

For details, refer to API-DIO HELP available after installing API-PAC(W32).

Connecting Input Signals

Connect the input signals to a device which can be current-driven, such as a switch or transistor output device.

The connection requires an external power supply to feed currents.

The board inputs the ON/OFF state of the current-driven device as a digital value.

Input Circuit

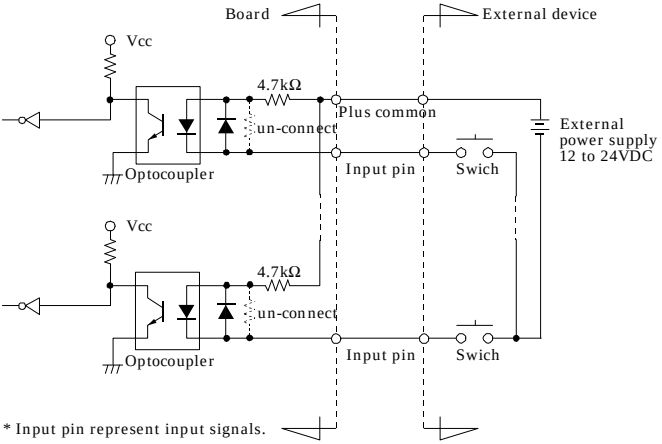
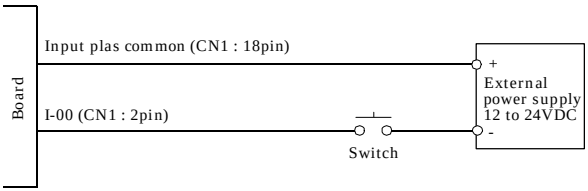


Figure 3.5. Input Circuit <PIO-16/16L(PCI)H>, <PO-32L(PCI)H>

The input circuits of interface blocks of the PIO-16/16L(PCI)H and PO-32L(PCI)H are illustrated in Figure 3.5. The signal inputs are isolated by opto-couplers (ready to accept current sinking output signals). The board therefore requires an external power supply to drive the inputs. The power requirement for each input pin is about 5.1 mA at 24 VDC (about 2.6 mA at 12 VDC).

Connecting a Switch



When the switch is ON, the corresponding bit contains 1.
When the switch is OFF, by contrast, the bit contains 0.

Figure 3.6. An Example to use Input I00 <PIO-16/16L(PCI)H>, <PO-32L(PCI)H>

Output Circuit

Connect the output signals to a current-driven controlled device such as a relay or LED.

The connection requires an external power supply to feed currents.

The board controls turning on/off the current-driven controlled device using a digital value.

Output Circuit

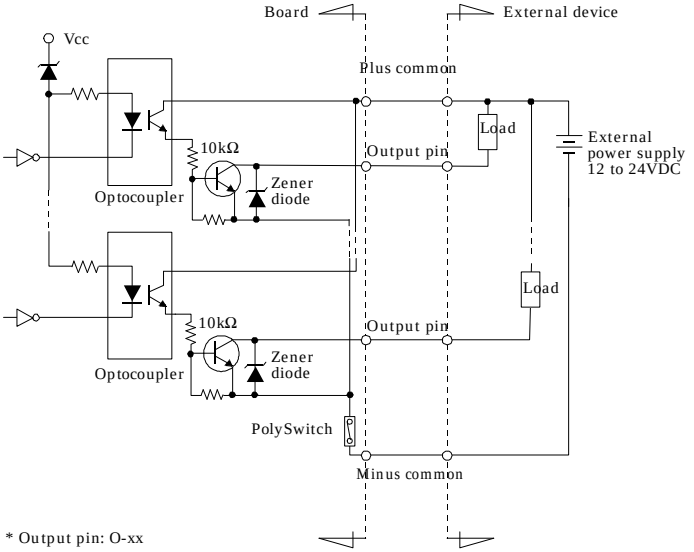


Figure 3.7. Output Circuit <PIO-16/16L(PCI)H>, <PO-32L(PCI)H>

The output circuits of interface blocks of the PIO-16/16L(PCI)H and PO-32L(PCI)H are illustrated in Figure 3.7. The signal output section is an opto-coupler isolated, open-collector output (current sink type). Driving the output section requires an external power supply.

The rated output current per channel is 100 mA at maximum.

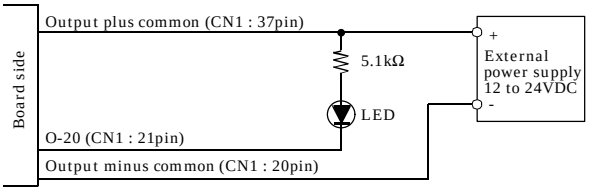
The output section can also be connected to a TTL level input as it uses a low-saturated transistor for output. The residual voltage (low-level voltage) between the collector and emitter with the output on is 0.5 V or less at an output current within 50 mA or at most 1.0 V at an output current within 100 mA.

A zener diode is connected to the output transistor for protection from surge voltages. A PolySwitch-based overcurrent protector is provided for every eight output transistors. When the overcurrent protector works, the output section of the board is temporarily disabled. If this is the case, turn of the power to the PC and the external power supply and wait for a few minutes, then turn them on back.

⚠ CAUTION

When the PC is turned on, all output are reset to OFF.

Connection to the LED



When "1" is output to a relevant bit, the corresponding LED comes on.
When "0" is output to the bit, in contrast, the LED goes out.

Figure 3.8. An Example to use Output O-20 <PIO-16/16L(PCI)H>, <PO-32L(PCI)H>

Example of Connection to TTL Level Input

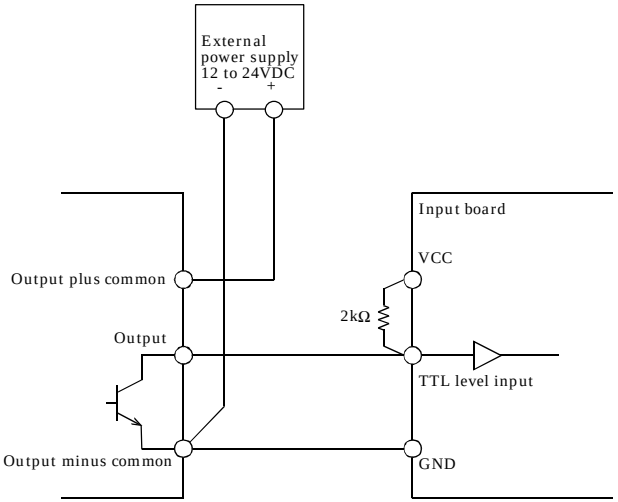


Figure 3.9. Connection Example of Output and TTL level Input Signal <PIO-16/16L(PCI)H>, <PO-32L(PCI)H>

Connecting the Sink Type Output and Sink Output Support Input

The following example shows a connection between a sink type output (output board) and a sink output support input (input board). Refer to this connection example when you connect such boards to each other.

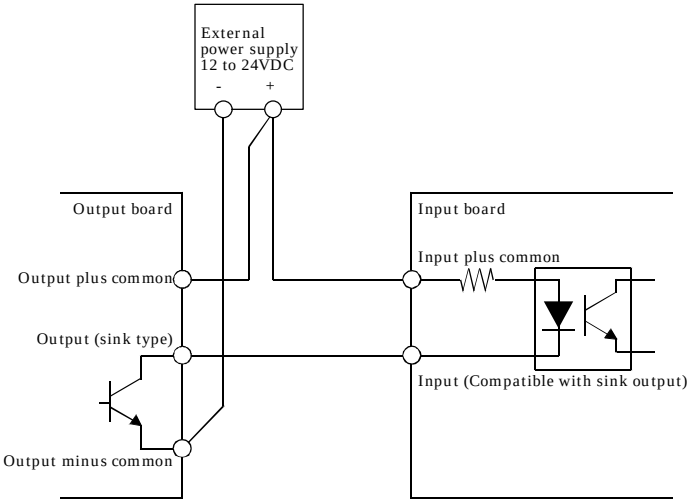


Figure 3.10. Example of Connecting the Sink Type Output and Sink Output Support Input

4. Function

This section describes the features of the board.

Each function described here can be easily set and executed by using the bundled API function library. For details, refer to API-DIO HELP available after installation.

Data I/O Function

Data Input

When input data is “ON”, “1” is input to the relevant bit.

When the input data is “OFF”, in contrast, “0” is input to the relevant bit

Data Output

When “1” is output to the relevant bit, the corresponding transistor is set to “ON”.

When “0” is output to the relevant bit, in contrast, the corresponding transistor is set to “OFF”.

⚠ CAUTION

When the PC is turned on, all output are reset to 0 (OFF).

Monitoring Output Data

The <PIO-16/16L(PCI)H> and <PO-32L(PCI)H> can read the state of the data currently being output without affecting the output data.

Digital Filter

Using this feature, the PIO-16/16L(PCI)H and PI-32L(PCI)H can apply a digital filter to every input pin, thereby preventing the input signal from being affected by noise or chattering.

Digital Filter Function Principle

The digital filter checks the input signal level during the sampling time of the clock signal. When the signal level remains the same for the digital filter set time, the digital filter recognizes that signal as the input signal and changes the signal level of the PC

If the signal level changes at a frequency shorter than the set time, therefore, the level change is ignored.

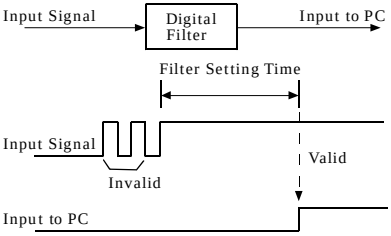


Figure 4.1. Digital Filter Function Principle

Set Digital Filter Time

Set the digital filter time to 0 to 24 (14h).

Setting the digital filter time to 0 disables digital filtering. It is set to 0 when the power is turned on.

Figure 4.2 shows the relationships between digital filter time settings and the actual digital filter times.

Digital Filter Time[sec.] = 2^n / (8 x 10^6)

n: = setting data(0 to 20)

Setting Data (n)	Digital Filter Time	Setting Data (n)	Digital Filter Time	Setting Data (n)	Digital Filter Time
0 (00h)	The filter function is not used.	7 (07h)	16µsec	14 (0Eh)	2.048msec
1 (01h)	0.25µsec	8 (08h)	32µsec	15 (0Fh)	4.096msec
2 (02h)	0.5µsec	9 (09h)	64µsec	16 (10h)	8.192msec
3 (03h)	1µsec	10 (0Ah)	128µsec	17 (11h)	16.384msec
4 (04h)	2µsec	11 (0Bh)	256µsec	18 (12h)	32.768msec
5 (05h)	4µsec	12 (0Ch)	512µsec	19 (13h)	65.536msec
6 (06h)	8µsec	13 (0Dh)	1.024msec	20 (14h)	131.072msec

Figure 4.2. Digital Filter Time and Setting Data

⚠ CAUTION

- If you set the digital filter time, the filter applies to all input pins. You cannot apply the filter only to a specific filter.
- Do not set Setting Data to a value outside the above range as doing so can cause the board to malfunction.

Interrupt Control Function

The PIO-16/16L(PCI)H and PI-32L(PCI)H can use all of the input signals as interrupt request signals.

The board can generate an interrupt request signal to the PC when the input signal change from High to Low or from Low to High.

When the digital filter (described above) is used, interrupt requests are generated by input signals that have passed through the filter.

Disabling/enabling Interrupts

Interrupt mask bits can be used to disable or enable the individual bits for interruptions.

Once a certain bit has been interrupt-disabled, no interrupt occurs even when the corresponding input signal changes its level.

To let interrupts occur, enable the corresponding interrupt mask bit for interruptions.

⚠ CAUTION

All of the interrupt mask bits are interrupt-disabled when the power is turned on.

Selecting the Interrupt Edge

Interrupt edge select bits can be used to set the input logic for interruption bit by bit.

If you set an interrupt edge select bit to 0, an interrupt occurs when the input value to the corresponding bit changes from 0 to 1 (at the fall of the input signal from High to Low).

If you set an interrupt edge select bit to 1, an interrupt occurs when the input value to the corresponding bit changes from 1 to 0 (at the rise of the input signal from Low to High).

⚠ CAUTION

When the power is turned on, all of the interrupt edge select bits are set to 0 so that an interrupt occurs when the input value changes from 0 to 1 (at the fall of the input signal from High to Low).

Clearing the Interrupt Status and Interrupt Signal

Interrupt status bits are used to identify the input signal bit being used for requesting an interrupt.

When an interrupt status is input, the interrupt request signal and the interrupt status are cleared automatically.

⚠ CAUTION

- All of the interrupt status bits are set to 0 when the power is turned on.
- If an interrupt mask bit has been set to disable interrupts, the interrupt status bit is not set even when the input signal changes its level.

5. About Software

The bundled CD-ROM “Driver Library Package API-PAC(W32)” contains the functions that provide the following features:

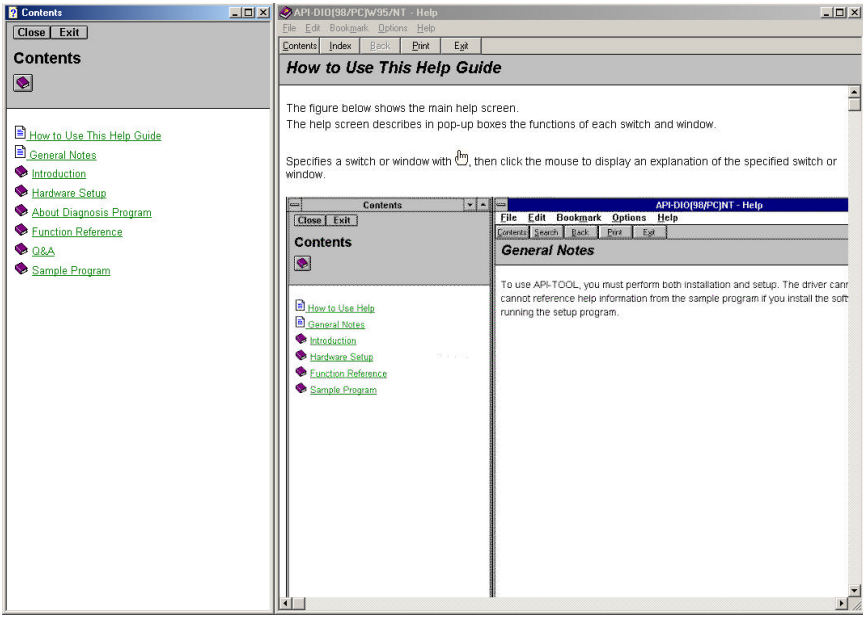
- Digital input/output of specified ports
- Hardware digital input/output of specified bits
- Hardware digital filtering that prevents chattering

For details, refer to the help file. The help file provides various items of information such as “Function Reference”, “Sample Programs”, and “FAQs”. Use them for program development and troubleshooting.

Accessing the Help File

(1) Click on the [Start] button on the Windows taskbar.

(2) From the Start Menu, select “Programs” – “CONTEC API-PAC(W32)” – “Dio” – “API-DIO HELP” to display help information.


Contents
Close
Exit
Contents
How to Use This Help Guide
General Notes
Introduction
Hardware Setup
About Diagnosis Program
Function Reference
Q&A
Sample Program
API-DIO[98/PC]W95/NT - Help
File Edit Bookmark Options Help
Contents Index Back Print Exit
How to Use This Help Guide
The figure below shows the main help screen.
The help screen describes in pop-up boxes the functions of each switch and window.
Specifies a switch or window with , then click the mouse to display an explanation of the specified switch or window.
Contents
Close
Exit
Contents
How to Use Help
General Notes
Introduction
Hardware Setup
Function Reference
Sample Program
API-DIO[98/PC]NT - Help
File Edit Bookmark Options Help
Contents Search Back Print Exit
General Notes
To use API-TOOL, you must perform both installation and setup. The driver cann
cannot reference help information from the sample program if you install the soft
running the setup program.

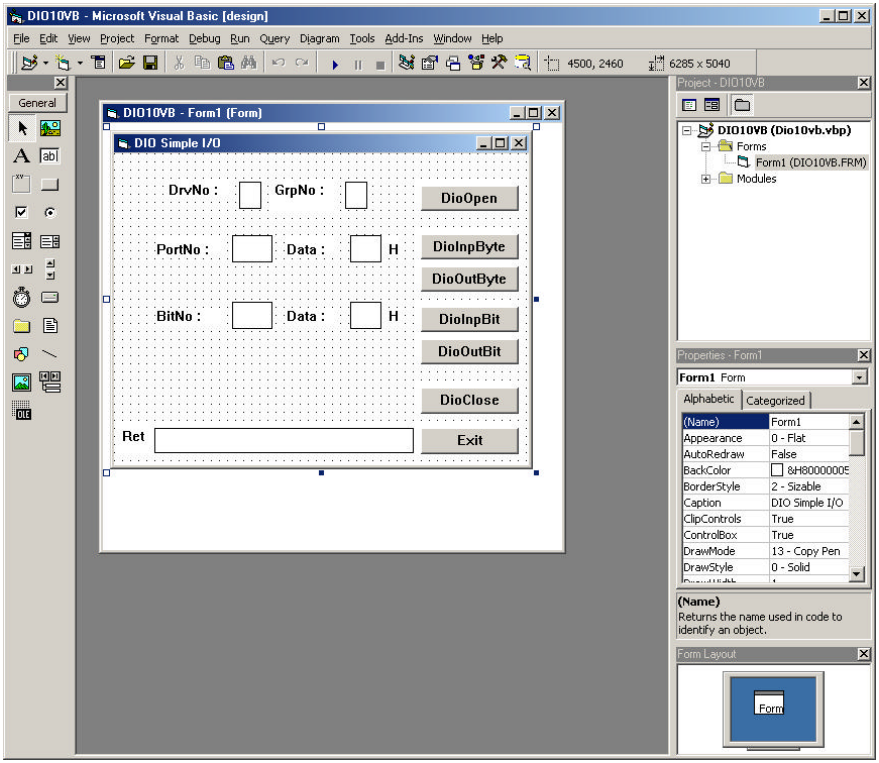
Using Sample Programs

Sample programs have been prepared for specific basic applications.

To use each sample program, enter its driver number and group number set by API-TOOL Configuration in the DrvNo and GrpNo fields.

Use these sample programs as references for program development and operation check.

The sample programs are stored in \Program Files\CONTEC\API-PAC(W32)\Dio\Samples.



Running a Sample Program

(1) Click on the [Start] button on the Windows taskbar.

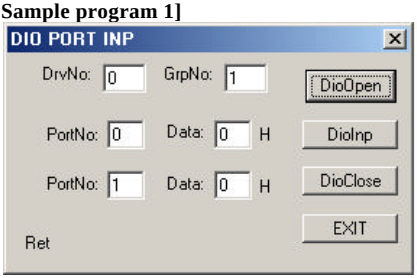
(2) From the Start Menu, select “Programs” – “CONTEC API-PAC(W32)” – “Dio” – “SAMPLE…”.

(3) A sample program is invoked.

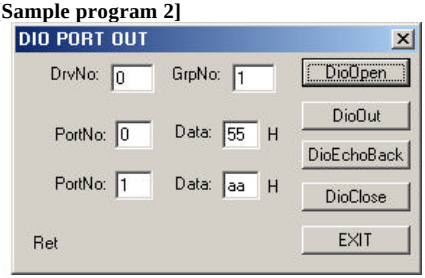
Sample Programs - Examples

-Sample program 1	:	Inputs digital data through a specified port.
-Sample program 2	:	Outputs digital data through a specified port.
-Sample program 3	:	Inputs/outputs digital data from/to a programmable board.
-Sample program 4	:	Inputs digital data from a specified port in the background.
-Sample program 5	:	Inputs/outputs digital data from/to a specified bit.
-Sample program 6	:	Services interrupts of a specified board.
-Sample program 7	:	Provides process control of a specified board.
-Sample program 8	:	Performs trigger monitoring of a specified board.
-Sample program 9	:	Inputs digital data through a specified port using BCD data.
-Sample program 10	:	Executes digital input (simple functions) at specified bits through a specified port.
-Sample program 11	:	Services interrupts of a specified board (using an extended function).
-Sample program (Console)	:	Inputs/outputs digital data through a specified port.

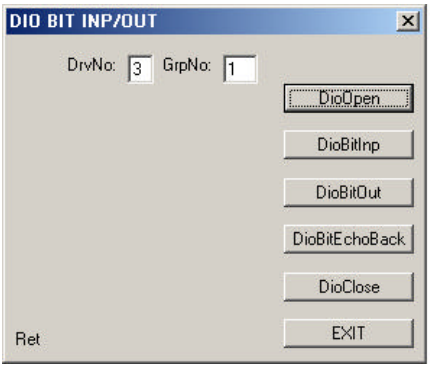
[Sample program 1]



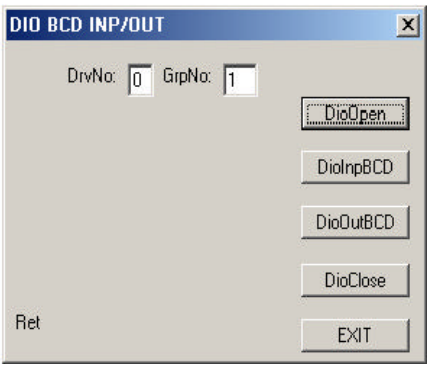
[Sample program 2]



[Sample program 5]



[Sample program 9]



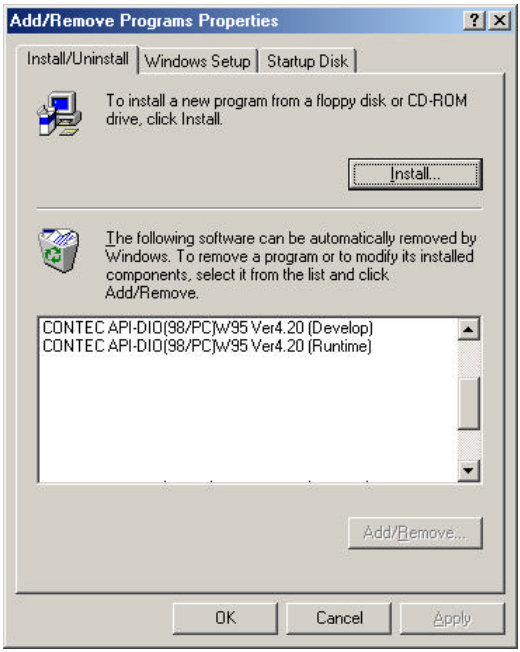
Uninstalling the Driver Libraries

To uninstall API-PAC(W32), follow the procedure below.

(1) Click on the [Start] button on the Windows taskbar. From the Start Menu, select “Settings” – “Control Panel”.

(2) Double-click on “Add/Remove Programs” in the Control Panel.

(3) Select “CONTEC API-DIO(98/PC)xx” from the application list displayed, then click on the [Add/Remove] button. Follow the on-screen instructions to uninstall the function libraries.


Add/Remove Programs Properties
Install/Uninstall
Windows Setup
Startup Disk
To install a new program from a floppy disk or CD-ROM drive, click Install.
Install...
The following software can be automatically removed by Windows. To remove a program or to modify its installed components, select it from the list and click Add/Remove.
CONTEC API-DIO(98/PC)W95 Ver4.20 (Develop)
CONTEC API-DIO(98/PC)W95 Ver4.20 (Runtime)
Add/Remove...
OK
Cancel
Apply

CD-ROM Directory Structure

```
\
|–Autorun.exe          Installer Main Window
|–Readmej.htm          Version information on each API-TOOL
|–APIPAC
|  |–AIO
|  |– Disk 1
|  |– Disk 2
|  |– ……
|  |  |– Disk N
|  |– CNT
|  |– ……
|– FreeSamples         Sample programs in Delphi and Builder
|  |– Builder 1.0
|  |–
|– HELP                HELP file
|  |– Aio
|  |– Cnt
|  |–
|– INF                 OS-specific INF file folder (Windows 9X, 2000)
|  |–WDM
|  |–Win2000
|  |– Win95
|– Manual              Reference manual (PDF form)
|– Readme              Driver readme file folder
|– Release             For creation of a user-specific install program
   |– API_NT
   |– API_W95
```

6. About Hardware

This chapter provides hardware specifications and hardware-related supplementary information.

Hardware specification

PIO-16/16L(PCI)H

Table 6.1. Specification < PIO-16/16L(PCI)H> < *1/2*>

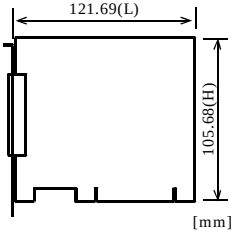
Item			Specification
Input			
	Input format		Opto-isolated input (Compatible with current sink output)(Negative logic *1)
	Number of input signal channels		16 channels (all available for interrupts) (1 common)
	Input resistance		4.7kΩ
	Input ON current		2.0mA or more
	Input OFF current		0.16mA or less
	Interrupt		16 interrupt input signals are arranged into a single output of interrupt signal INTA. An interrupt is generated at the rising edge (HIGH-to-LOW transition) or falling edge (LOW-to-HIGH transition).
	Response time		200µsec within
Output			
	Output format		Opto-isolated open collector output (current sink type) (Negative logic*1)
	Number of output signal channels		16 channels (1 common)
	Output rating	Output voltage	35VDC (Max.)
		Output current	100mA (par channel) (Max.)
	Residual voltage with output on		0.5V or less (Output current≤50mA), 1.0V or less (Output current≤100mA)
	Surge protector		Zener diode RD47FM(NEC)
	Response time		200µsec within
Common			
	I/O address		Any 32-byte boundary
	Interruption level		1 level use
	Max. board count for connection		16 boards including the master board
	Dielectric strength		1000Vrms
	External circuit power supply		12 to 24VDC(±10%)
	Power consumption		5VDC 200mA(Max.)
	Operating condition		0 to 50°C, 10 to 90%RH (No condensation)

Table 6.1. Specification < PIO-16/16L(PCI)H> < *2/2*>

Item		Specification
	Allowable distance of signal extension	Approx. 50m (depending on wiring environment)
	PCI bus specification	33bit, 33MHz, 5V/3.3V
	Dimension (mm)	121.69(L) x 105.68(H)
	Weight	130g

*1 Data “0” and “1” correspond to the High and Low levels, respectively.

Board Dimensions



The standard outside dimension (L) is the distance from the end of the board to the outer surface of the slot cover.

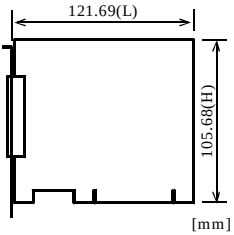
PI-32L(PCI)H

Table 6.2. Specification < PI-32L(PCI)H>

Item		Specification
Input section		
	Input format	Opto-isolated input (Compatible with current sink output)(Negative logic *1)
	Number of input signal channels	32 channels (all available for interrupts) (One common power supply per 16 channels)
	Input resistance	4.7kΩ
	Input ON current	2.0mA or more
	Input OFF current	0.16mA or less
	interrupt	32 interrupt input signals are arranged into a single output of interrupt signal INTA. An interrupt is generated at the rising edge (HIGH-to-LOW transition) or falling edge (LOW-to-HIGH transition).
	Response time	200μsec within
Common section		
	I/O address	Any 32-byte boundary
	Interruption level	1 level use
	Max. board count for connection	16 boards including the master board
	Dielectric strength	1000Vrms
	External circuit power supply	12 to 24VDC(±10%)
	Power consumption	5VDC 200mA(Max.)
	Operating condition	0 to 50°C, 10 to 90%RH (No condensation)
	Allowable distance of signal extension	Approx. 50m (depending on wiring environment)
	PCI bus specification	33bit, 33MHz, 5V/3.3V
	Dimension (mm)	121.69(L) x 105.68(H)
	Weight	130g

*1 Data “0” and “1” correspond to the High and Low levels, respectively.

Board Dimensions



The standard outside dimension (L) is the distance from the end of the board to the outer surface of the slot cover.

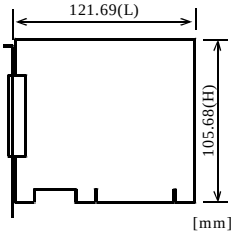
PO-32L(PCI)H

Table 6.3. Specification < PO-32L(PCI)H>

Item		Specification
Output section		
Output format		Opto-isolated input (Compatible with current sink output)(Negative logic *1)
Number of output signal channels		32 channels(One common power supply per 16 channels)
Output rating	Output voltage	35VDC (Max.)
	Output current	100mA (par channel) (Max.)
Residual voltage with output on		0.5V or less (Output current≤50mA), 1.0V or less (Output current≤100mA)
Surge protector		Zener diode RD47FM(NEC)
Response time		200µsec within
Common section		
I/O address		Any 32-byte boundary
Interruption level		Not used
Max. board count for connection		16 boards including the master board
Dielectric strength		1000Vrms
External circuit power supply		12 to 24VDC(±10%)
Power consumption		5VDC 200mA(Max.)
Operating condition		0 to 50°C, 10 to 90%RH (No condensation)
Allowable distance of signal extension		Approx. 50m (depending on wiring environment)
PCI bus specification		33bit, 33MHz, 5V/3.3V
Dimension (mm)		121.69(L) x 105.68(H)
Weight		130g

*1 Data “0” and “1” correspond to the High and Low levels, respectively.

Board Dimensions



The standard outside dimension (L) is the distance from the end of the board to the outer surface of the slot cover.

Block Diagram

PIO-16/16L(PCI)H

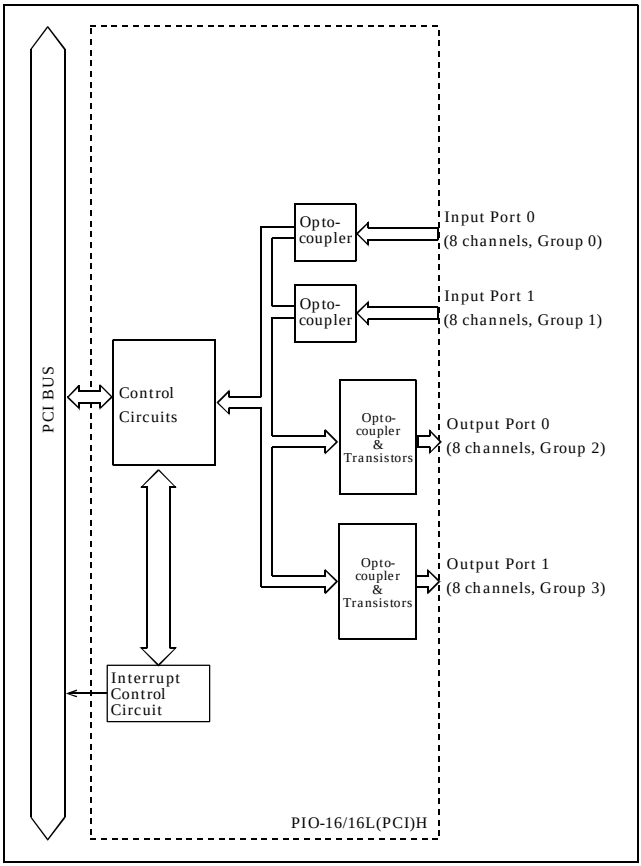


Figure 6.1. Block Diagram < PIO-16/16L(PCI)H>

PO-32L(PCI)H

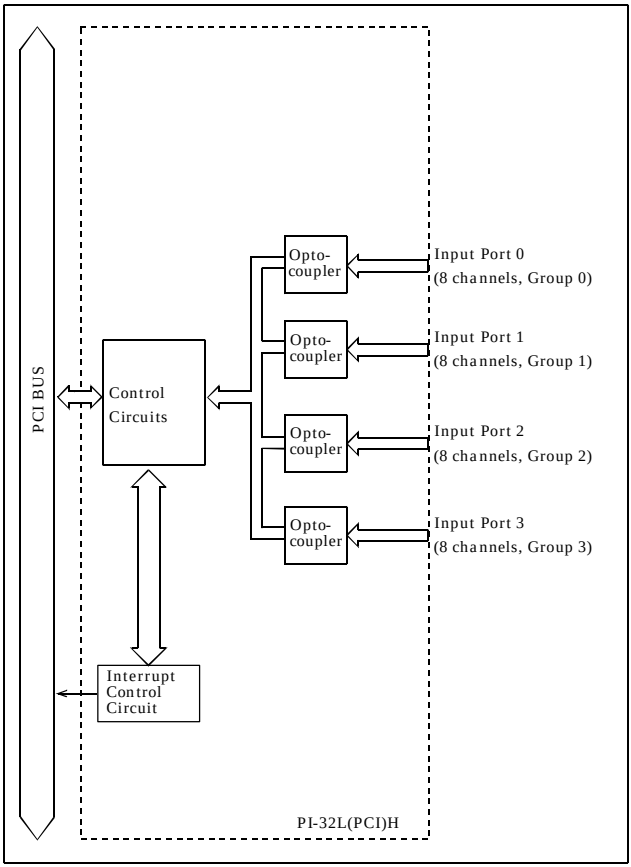


Figure 6.2. Block Diagram < PI-32L(PCI)H>

PO-32L(PCI)H

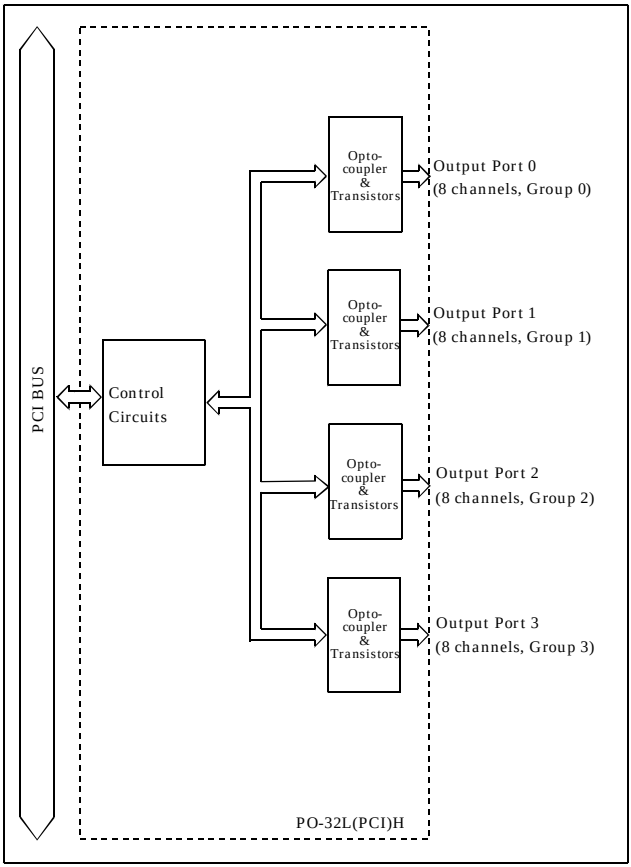


Figure 6.3. Block Diagram < PO-32L(PCI)H>

Differences between the PIO-16/16L(PCI)H and PIO-16/16L(PCI)

The PIO-16/16L(PCI)H is connector-pin compatible with the conventional PIO-16/16L(PCI) but has the following differences from it:

(1) Different in the number of input signals available to interrupt requests
PIO-16/16L(PCI)H : All of 16 channels
PIO-16/16L(PCI) : 4 channels

(2) Different in the expression to calculate the digital filter time (n: setting value)
PIO-16/16L(PCI)H : $2n / (8 \times 10^6)$
PIO-16/16L(PCI) : $2n / (16 \times 10^6)$

(3) Protective elements provided for outputs
PIO-16/16L(PCI)H : Surge protector: Zener diode
PIO-16/16L(PCI) : Nothing

(4) Different in interrupt level resource allocation
PIO-16/16L(PCI)H : Automatically allocates on interrupt level.
PIO-16/16L(PCI) : Uses a jumper switch to select whether to allocate interrupt levels.

(5) Different in board dimensions
PIO-16/16L(PCI)H : 121.69(L) x 105.68(H) mm
PIO-16/16L(PCI) : 176.41(L) x 106.68(H) mm

Differences between the PI-32L(PCI)H and PI-32L(PCI)

The PI-32L(PCI)H is connector-pin compatible with the conventional PI-32L(PCI) but has the following differences from it:

(1) Different in the number of input signals available to interrupt requests
PI-32L(PCI)H : All of 32 channels
PI-32L(PCI) : 4 channels

(2) Different in the expression to calculate the digital filter time (n: setting value)
PI-32L(PCI)H : $2n / (8 \times 10^6)$
PI-32L(PCI) : $2n / (16 \times 10^6)$

(3) Different in interrupt level resource allocation
PI-32L(PCI)H : Automatically allocates on interrupt level.
PI-32L(PCI) : Uses a jumper switch to select whether to allocate interrupt levels.

(4) Different in board dimensions
PI-32L(PCI)H : 121.69(L) x 105.68(H) mm
PI-32L(PCI) : 176.41(L) x 106.68(H) mm

Differences between the PO-32L(PCI)H and PO-32L(PCI)

The PO-32L(PCI)H is connector-pin compatible with the conventional PO-32L(PCI) but has the following differences from it:

(1) Protective elements provided for outputs

PO-32L(PCI)H	:	Surge protector: Zener diode
PO-32L(PCI)	:	Nothing

(2) Different in board dimensions

PO-32L(PCI)H	:	121.69(L) x 105.68(H) mm
PO-32L(PCI)	:	176.41(L) x 106.68(H) mm

CONTEC Group

JAPAN : Headquarters
CONTEC Co., LTD.
3-9-31, Himesato, Nishiyodogawa-ku, Osaka 555-0025, Japan
Tel : +81 (6) 6477-5219 Fax : +81 (6) 6477-1692
E-mail : intsales@osaka.contec.co.jp

U.S.A. : CONTEC MICROELECTRONICS U.S.A. INC.
744 South Hillview Drive, Milpitas, CA 95035 U.S.A.
Tel : +1 (408) 719-8200 Fax : +1 (408) 719-6750
E-mail : tech_support@contecusa.com

EUROPE : CONTEC MICROELECTRONICS EUROPE B.V.
Binnenweg 4, 2132 CT, Hoofddorp, The Netherlands
Tel : +31 (23) 567-3030 Fax : +31 (23) 567-3035
E-mail : tech_support@conteceu.nl

KOREA : HYOJIN CONTEC Co., LTD.
Ki-im Bldg. #399, Shindolim-Dong, Kuro-ku, Seoul, Korea
Tel : +82 (2) 2636-4277/8 Fax : +82 (2) 2636-4279
E-mail : product@conteck.com

CHINA : INTERNATIONAL CONTEC TECHNOLOGY CO., LTD.
B-8F, Hua Tong Building, No. B19, Che Gong Zhuang West Road,
Hai Dian District, Beijing 100044, China
Tel : +86(10)8801-8228 Fax : +86 (10)8801-8209
E-mail : ict@ict.com.cn

SHANGHAI CONTEC MICROELECTRONICS CORP.
No. 481 Gui Ping Road, Cao He Jing Hi-Tech Park Shanghai, 200233, China
Tel : +86 (21) 6485-1907 Fax : +86 (21) 6485-0330
E-mail : contec@contec.com.cn

SHENYANG CONTEC MICROELECTRONICS Co., LTD.
No. 169, Qingnian Street, Shenhe District, Shenyang 110015, China
Tel : +86 (24) 2392-9771 Fax : +86 (24) 2392-9773

TAIWAN : MACROMATE CORP.
8F, Universal Center, No.179, Ta-Tung Rd., Sec.1 Hsi-Chih, Taipei Hsien, Taiwan, R.O.C
Tel : +886 (2) 2647-9353 Fax : +886 (2) 2647-9373
E-mail : intl@macromate.com.tw